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THESIS

Activity-Based Costing
In A
Service Organization

by

Frank W. Spence

June, 1993

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Activity-Based Costing
In A
Service Organization

by
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Commander, United States Navy
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Submitted in partial fulfillment
of the requirements for the degree of

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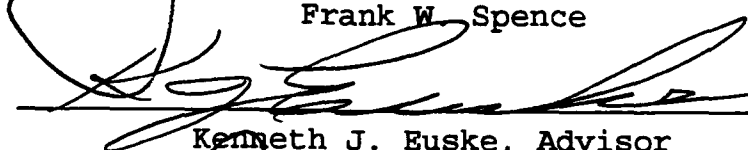
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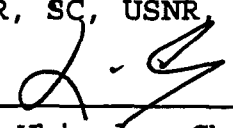
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ABSTRACT

Relative to research on activity-based costing in manufacturing environments, very little research has been done in service organizations. This thesis is a comparative analysis of a traditional cost accounting system with an activity-based cost accounting system in a medium-sized mass transit system. The purpose of the analysis was to determine whether activity-based accounting techniques can effectively be applied in a service industry. In addition, a goal for the thesis was to determine which costing system reports a more precise estimate of the cost of the output. The author concluded that an activity-based system does provide a more precise estimate of the output costs.

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I. INTRODUCTION

A. BACKGROUND

Public transit systems exist throughout the United States and vary in size and complexity. Although the systems may differ in size and complexity, they share some common traits. They are service-oriented, regulated, and subsidized by government funds (local, state and/or federal). The issue that this thesis addresses is the costing of the product of a specific service organization, a public transit system.

Monterey-Salinas Transit, the site chosen for this thesis, is a public transit organization serving the Monterey Bay area of California. Monterey-Salinas Transit, like many government subsidized agencies, is regulated by government standards. These standards encompass financial and operational aspects of the organization.

B. THESIS OBJECTIVE

The objective of this thesis is to conduct a comparative analysis of a traditional cost accounting system with an activity-based accounting system in a service environment. The analysis includes a determination of which system of accounting provides a more accurate tracking of the resources utilized by the service organization.

1. Scope and Limitations

The scope of this thesis is limited to an accounting perspective; therefore, some aspects of Monterey-Salinas Transit are not addressed. Political and regulatory constraints are examples of issues that are presented to provide the reader with background, though not meant to be the focus of discussion.

C. RESEARCH METHODOLOGY

Three research methodologies (archival, empirical, and analytical) are used to develop and analyze the information presented in this thesis.

1. Archival Research

Archival research, in the form of a detailed literature review, was conducted to examine three major subject areas: organization and operating characteristics of public mass transit systems, traditional cost accounting in mass transit, and activity-based cost accounting. The sources of archival information for each subject are detailed below.

Information on public mass transit systems was drawn primarily from U.S. Department of Transportation publications, *Handbook for Management Performance Audits and Strategic Planning in Small and Medium-Size Transit Agencies*, and from the *Monterey-Salinas Short-Range Transit Plan*. In addition, a review of books and periodicals was conducted.

Information regarding traditional cost-accounting inadequacies was drawn from *Financial Management for Transit: A Handbook*, published by the U.S. Department of Transportation, and a review of other books and periodicals.

Information regarding activity-based accounting was also drawn from a review of books and periodicals.

2. Empirical Research

Empirical research was accomplished in the form of interviews and data gathering. The interviews primarily involved the Assistant General Manager of Monterey-Salinas Transit. The Assistant General Manager also serves as the Chief Financial Officer of Monterey-Salinas Transit.

3. Analytical Research

Analytical research was employed to analyze data, develop cost relationships in mass-transit systems, and develop conclusions regarding application of an activity-based accounting system in a service oriented organization.

D. THESIS ORGANIZATION

This thesis has five chapters. Chapter I states the objective of the thesis and discusses the research methodologies utilized. Chapter II is an overview of Monterey-Salinas Transit which includes a discussion of its structure, operating goals, and financial data. In Chapter III, traditional cost accounting systems are described and the concepts of activity-based accounting are introduced.

Additionally, inadequacies of traditional accounting systems when compared to activity-based systems are underscored. Chapter IV proposes an approach for implementation of activity-based costing at Monterey-Salinas Transit. Chapter IV also presents a hypothetical activity-based costing system for Monterey-Salinas Transit and compares the output against their traditional accounting system. The final chapter, Chapter V, summarizes the research, draws conclusions, and makes recommendations.

II. MST: PUBLIC TRANSIT

A. CHARACTERISTICS OF PUBLIC TRANSIT

Public transit, for the purpose of this thesis, is taken to mean a publicly owned and operated mass transit system. Public transit systems exist in various sizes and degrees of operating complexity; however, there are characteristics common to all. As public agencies, operating in part on public funds, these transit systems exist to serve the public interests. The funds that subsidize these systems come with a variety of regulations and compliance requirements that must be incorporated by management. The operating environment is characterized by regulation applied at whatever level funding is received, from federal to local. (DOT Publication-A, 1988)

Public transit systems are also typified by the requirement to report to some sort of governing body. The type, authority, responsibilities, and membership of the governing body is generally determined by state law. Commonly, the type of funds available (sales tax, property tax, et cetera) dictate the most appropriate type of governing body. (DOT publication-A, 1988)

B. MONTEREY-SALINAS TRANSIT

This section provides a summary of the organization, goals, objectives, and issues facing Monterey-Salinas Transit.

Current performance metrics and the system used to perform these measures are also covered in this section.

1. Organization of Monterey-Salinas Transit

Monterey-Salinas Transit is a medium-sized public transit system serving the North Monterey County of California. (DOT Publication-B,1986; SRTP, 1992) The system was formed in 1981 by the combination of two systems, the Salinas Transit System and Monterey Peninsula Transit. The organization is now operated by a joint powers agency with members from the cities of Carmel, Del Rey Oaks, Marina, Monterey, Pacific Grove, Salinas, and Seaside, and the County of Monterey. Representatives from each of the eight jurisdictions form the Board of Directors which governs the agency and appoints the General Manager. (SRTP, 1992)

The General Manager is responsible for the management and operation of Monterey-Salinas Transit. An Assistant General Manager, Director of Transportation, and Director of Maintenance assist the General Manager in directing Monterey-Salinas Transit. The Assistant General Manager serves as the head of the Administration Department and Chief Financial Officer. The Director of Transportation is responsible for the vehicle operation and field supervision, and the Director of maintenance directs vehicle and fixed-facility repair, maintenance, and cleaning. Figure 2.1 presents the

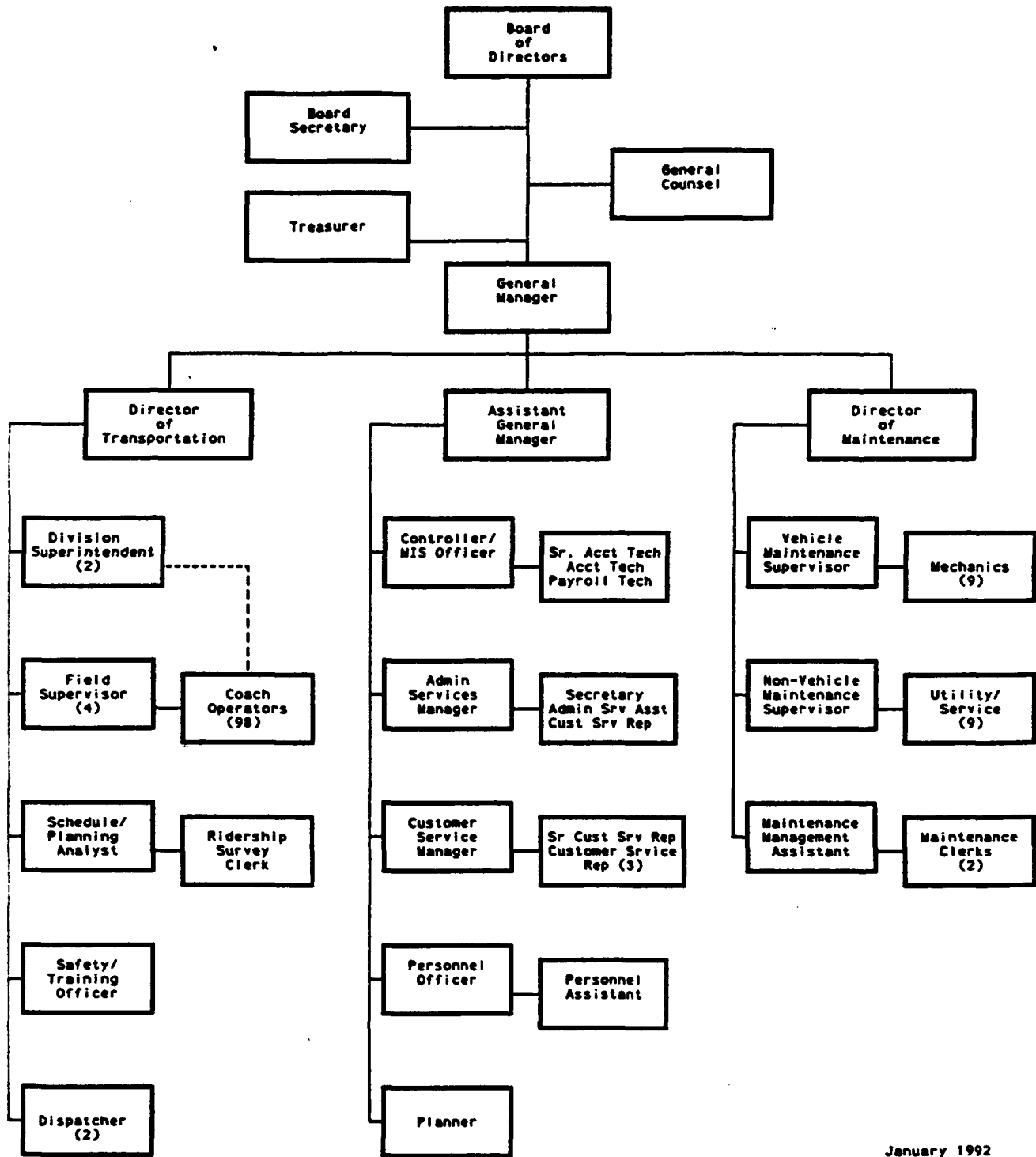
organization chart of Monterey-Salinas Transit and its 151 employees: (SRTP,1992)

2. Goals and Mission

Monterey-Salinas Transit is guided in its operations by five broad goals. The goals serve as principles from which objectives and policies are derived. Further, the goals are utilized as measures against which performance is gaged. The five goals are restated in Table 2.1

TABLE 2.1: MST GOALS

- | |
|--|
| <p>Goal 1:
Provide an accessible public transportation system.</p> <p>Goal 2:
Provide a reliable transportation system.</p> <p>Goal 3:
Provide an effective transportation system.</p> <p>Goal 4:
Provide an efficient public transportation system.</p> <p>Goal 5:
Seek favorable coordination of transit-related policies and decisions by other public and private agencies. (SRTP,1992)</p> |
|--|



January 1992

Figure 2.1: MST Organization Chart

The goals of Monterey-Salinas Transit are in turn complemented by a mission statement. The mission statement for Monterey-Salinas Transit provides the framework for future development and an overall vision for the organization. (See Table 2.2.)

TABLE 2.2: MST MISSION STATEMENT

Monterey-Salinas Transit's mission is to provide a safe, efficient, high quality public transportation system for the greatest number of residents and visitors to Monterey County. MST will offer such a system by:

- balancing the needs of the customers with the need for operational efficiency;
- recognizing the growing importance of public transit and delivering services which appeal to increasing numbers of people;
- emphasize customer service along with equipment and facilities that are clean and attractive;
- operating responsibly and cost effectively within budget;
- coordinating services with other public transportation providers in the MST service area; and
- through the provision of such services, contribute to a safer, cleaner, less congested environment. (SRTP,1992)

3. Performance

Monterey-Salinas Transit operates 57 revenue generating vehicles in its fleet, the average age of which is eight years. Monterey-Salinas Transit also maintains five or six spare vehicles in order to restore interruptions in service, to allow for maintenance requirements, and to provide for training. (SRTP,1992) During Fiscal Year 1992, Monterey-Salinas Transit operated its revenue vehicles a total of 153,011 hours and carried an annual total of 3,596,376 passengers. (LGFA, 1992)

In Fiscal Year 1992, Monterey-Salinas Transit generated revenues totalling \$8,179,522. Transit fares accounted for \$2,430,503 (29.71 percent) of those revenues; the remaining funds were largely from a local cash grant (local transportation fund) and federal cash grants. (LGFA, 1992) Operating expenses for Fiscal 1992 amounted to \$8,179,522; depreciation of property acquired by Monterey-Salinas Transit funds was assessed at \$1,205,855 giving a total of \$9,385,377 for fiscal year expenses.

In terms of passenger-generated revenue performance, California state law requires that farebox (passenger) revenue for Monterey-Salinas Transit be a minimum of 28.7 percent of operating expenses. Monterey-Salinas Transit achieved a ratio of 30 percent, exceeding state requirements. However, Monterey-Salinas Transit did not meet the Board of Director's standard of 34 percent in 1992. (LGFA,1992; SRTP,1992)

4. Major Issues Facing MST

Several issues are confronting Monterey-Salinas Transit in the near- and long-term future. These issues all have fiscal impact on Monterey-Salinas Transit and will require appropriate responses to ensure continued financial health of the organization. The issues facing Monterey-Salinas Transit are extracted from the current Monterey-Salinas Transit Short-Range Transit Plan covering fiscal years 1993 to 1997.

a. Foregone Revenues

Current fiscal constraints are resulting in Monterey-Salinas Transit's inability to serve a growing number of trip origins and destinations. Monterey-Salinas Transit cannot afford to adequately respond with increased service and new routes requested by major employers, even though employers must rely more heavily on transit in order to comply with current air quality and traffic congestion legislation. In addition, Monterey-Salinas Transit has obligated itself to service in areas that serve elderly and people of limited means although these service areas may not meet Monterey-Salinas Transit's productivity standards. The end result in either case is reduced revenues. Monterey-Salinas Transit is currently seeking alternative forms of funding to alleviate these shortfalls. Alternatives being researched include funding from new and existing state and federal programs, and

funding from employers requesting additional or new service as a result of compliance with local laws governing congestion and air pollution.

b. Compliance with legislation

Recent legislation in the form of the Americans with Disabilities Act (ADA) and the Clean Air Act of 1990 (CAA) will have profound financial impact on Monterey-Salinas Transit. The ADA requires access to public transportation systems for people with disabilities equal to access enjoyed by the able-bodied. In order to comply, Monterey-Salinas Transit must implement paratransit service beginning in Fiscal Year 1993 and must provide paratransit service equivalent to its fixed route service by January, 1997. Monterey-Salinas Transit estimates costs of \$1.57 million dollars beyond Federal grants in order to comply with ADA requirements. The source of the additional funding is not yet identified.

Implementation of the standards of the Clean Air Act of 1990 will also have a financial impact on Monterey-Salinas Transit. Although the stringency of the requirements of the federal law is not yet known, based on history it is not unreasonable to assume that the requirements enacted by the state of California precede and may be more stringent than federal law. At this point, Monterey-Salinas Transit can only speculate on the standards and the costs associated with implementing alternatives. One such alternative is converting

diesel bus engines to methanol engines. In a study conducted by Golden Gate Transit, the incremental cost of methanol engines as compared to similar-sized diesel engines for maintenance and operation could be \$30,000 per coach per year. This equates to an additional \$1.6 million dollar operating expense; Monterey-Salinas Transit has not yet identified the additional source of revenue to cover this expense.

c. Military base realignment

The downsizing of Fort Ord will have enormous impact on the economy of Monterey County as well as the Monterey-Salinas Transit operations. It is expected that between October 1993 and October 1994, 14,300 active duty military personnel and 17,000 dependent family members will leave the base. In addition, civilian labor required on the base will be reduced by 60 percent, or from 3,850 to 1,580 personnel. The effect on Monterey-Salinas Transit revenues will occur in two areas. The first and more obvious will be in a smaller base from which to draw ridership. The second area effected will be funding generated by local sales tax.

Based on a 1988 study, Monterey-Salinas Transit concluded that 7.8 percent of military dependents relied upon Monterey-Salinas Transit for basic transportation (the soldiers were assumed to not use Monterey-Salinas Transit). Also based on historical information, transit riders were assumed to make 150 trips each year, which translates into

198,900 trips and \$143,208 of lost farebox revenues. Accounting for the reduction of the civilian workforce at Fort Ord adds an additional reduction of 82,836 annual trips and a loss of \$89,462 in farebox collections.

As mentioned, the second area impacted by the closure of Fort Ord is funds generated from sales tax. Currently, Monterey-Salinas Transit receives approximately 45 percent of its operating support from a portion of the local sales tax. It has been estimated by Monterey-Salinas Transit staff that the loss to local sales from the decrease in military and civilian payrolls between October 1993 and October 1995, will amount to 49 million dollars. This equates to a loss of Local Transportation Funds (LTF) of \$122,500 in two years. Direct military procurement in the local economy will also decrease. This decrease is expected to be approximately 35 million dollars and a consequent reduction of \$87,500 of Local Transportation Funds to Monterey-Salinas Transit during the same two year period.

In conclusion, the impact of downsizing Fort Ord may decrease revenues to Monterey-Salinas Transit by approximately \$432,670 annually, or 5.5 percent of Fiscal 1991 revenue. The total loss in ridership may be as high as nine percent. The issue of decreased passenger revenue may be compounded by cuts in federal funding due to a projected decline in the population in the Monterey urbanized area.

Table 2.3 provides the details and summation of the impact of Fort Ord's downsizing.

TABLE 2.3: IMPACT OF FORT ORD DOWNSIZING

Group	Number	MST %	Annual Trips	Ridership % Change	Annual Revenue	Revenue % Change
Military Dependent	17,000	.078	198,900	- 5.5	\$143,208	- 1.8
Civilians	15,061	.055	124,250	- 3.4	89,462	- 1.1
Subtotal	32,061		215,436	- 8.9	\$232,670	- 2.9
Local Transportation Funds						
Retail Sale	\$49 M	.025	na	na	\$122,500	- 1.5
Military Procurement	\$35 M	.025	na	na	87,500	- 1.1
Subtotal	\$84 M	.025	na	na	\$210,000	- 2.6
				TOTAL	\$432,670	- 5.5

C. SUMMARY

Monterey-Salinas Transit is a medium-sized public transit system serving Monterey County in California. As a public transit system, Monterey-Salinas Transit is regulated and constrained in its ability to respond to fiscal changes in its external environment. Monterey-Salinas Transit maintains no reserve funds for operations and, as such, must continually be innovative, seeking ways to generate new revenues and cut costs.

The next chapter explores traditional cost accounting systems and the shortcomings associated with accounting for resources in a service-oriented organization. The concepts of activity-based accounting are introduced and discussed as an alternative management tool to the traditional systems.

III. ACCOUNTING: TRADITIONAL VERSUS ACTIVITY-BASED

A. INTRODUCTION

This chapter examines traditional accounting systems and the weaknesses inherent in them. The accounting system utilized at Monterey-Salinas Transit is briefly described; to conclude the chapter, activity-based costing (ABC) is introduced.

B. TRADITIONAL ACCOUNTING SYSTEMS

1. Background

Accounting and the reports of accounting systems can be traced back to ancient civilizations. Records of accounting have been found in the form of inscriptions on the walls of Egyptian ruins and in stone and clay tablets. Systems to account for food and goods actually preceded the development of a written language. (Eskew and Jenson, 1992) Double-entry bookkeeping was described in detail five hundred years ago by a Venetian monk, Fra Luca Paciolo. (Brown and Johnson, 1984)

From these early beginnings, accounting and bookkeeping techniques evolved as transactions and markets became more complex. Improvements in communications and transportation and the advent of the Industrial Revolution increased the need for managers to have access to financial information in order to make and support business decisions.

Businesses became vertically integrated, more diverse, and larger, taking advantage of economies of scale. This diversification led the senior managers at Du Pont Powder Company to develop one of the most enduring accounting innovations - the return on investment (ROI). (Johnson and Kaplan, 1987)

Innovation in accounting gradually slowed. To quote Johnson and Kaplan,

By 1925 virtually all management accounting practices used today had been developed: cost accounts for labor, material, and overhead; budgets for cash, income, and capital; flexible budgets, sales forecasts, standard costs, variance analysis, transfer prices, and divisional performance measures. (1987, p.12)

In addition, the focus of accounting had gradually shifted from the internal-user to the external-user of financial data. The shift toward full-cost information was precipitated by the need to satisfy those that provided the capital for firms. The belief that one accounting system could adequately serve internal and external users became widespread. This view was inculcated in accounting courses and textbooks in the 1950's. (Euske, 1991; Deakin and Maher, 1991) Accountants, well-trained in external reporting requirements, responded to internal users' needs for financial data by claiming that full-cost information, if properly adjusted, would be sufficient. The adjustments came in the form of classifying costs as fixed or variable based on output. This approach

ignored the problems associated with the collection of manufacturing and administrative overhead costs. (Euske, 1991)

Traditional cost accounting systems have responded with the allocation of these costs in a myriad of ways. There is no consensus as to the correct allocation method and whether to allocate at all is up for debate. (Brummet, 1957) As firms have grown in size and diversity, the application of overhead has become a significant matter.

C. ACCOUNTING AT MONTEREY-SALINAS TRANSIT

Accounting practices at Monterey-Salinas Transit follow traditional accounting principles. Recognition of revenues and expenses follow accepted accrual methods and the chart of accounts are standard among transit agencies funded by the federal government.

As stated in Chapter II, public transit is a regulated industry. Monterey-Salinas Transit, by accepting government subsidies at the federal, state, and local level, must conform with requirements dictated by each level of government. An example of one requirement is the State of California requisite to maintain a minimum farebox recovery ratio of 28.7 percent of operating expenses. Compliance is ensured, in part, by annual audits conducted by an independent auditor. The results of the audit are forwarded to the state controller of California. (DOT-C, 1985)

D. ACTIVITY-BASED COSTING

The purpose of this section is to describe activity-based costing (ABC) and how it produces financial and performance data without the distortions present in traditional accounting systems. Concepts of ABC and the design and implementation of an ABC system will also be presented in this section.

1. Concepts

Activity-based costing is neither a new nor a complex concept. The precepts that ABC are based upon are uncomplicated and were described by accountants in the 1800's and early 1900's. (Cokins et al, 1993) Activity-based costing (and activity-based management (ABM), described later) springboards from three simple concepts: activity, driver, and process. The following passage from Euske (1991) describes these three notions and the relationship among them.

Three basic concepts are important in thinking about designing systems that focus on costing the appropriate tasks or activities: *activity*, *driver*, and *process*. An *activity* is a task performed in the organization that can be assigned costs (e.g., labor hours of task x cost per hour = cost of task). Examples of tasks are designing, order entry, and machining of parts.

The second concept that is important is that of the *driver*, a generator of a cost or activity. A driver can be thought of as an event or decision. Drivers are not activities. Examples of drivers are customer commitments, decisions on employee training material shortages, and missed schedules. Activities are associated with each driver, and therefore costs are associated with each driver.

The third concept of importance is *process*. A process is a chain of drivers (e.g., incomplete design → engineering changes → material shortages → missed schedules). The

drivers are associated with activities and, as a consequence of activities, with costs. The result is the cost impact of decisions and events within the process. (Euske, 1991)

As stated previously, ABC concepts are not new. According to Turney (1992), early accounting systems with ABC attributes were limited by the absence of direct information about activities. Systems, such as the one implemented by John Deere Component Works to cost screw-machine parts, focused on application of overhead. The overhead was collected in pools that were associated with activities that were performed in the production of the parts. Figure 3.1 details these seven cost pools in the early John Deere ABC system.

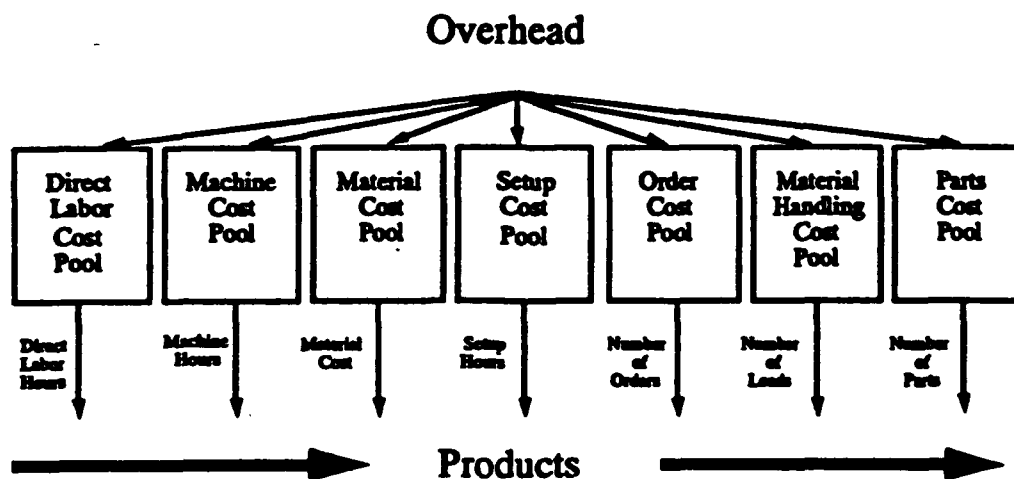


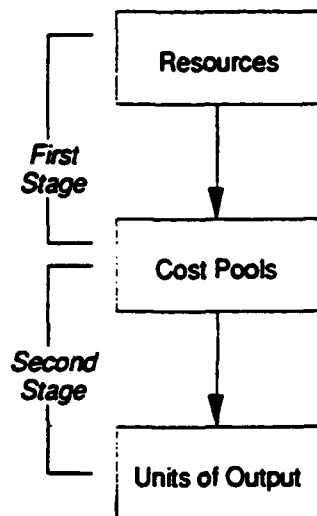
Figure 3.1: Early ABC Model
Source: Turney, 1992

Overhead was then applied using a unique factor that approximated the consumption of costs for the activity performed. Products that required more activities in production appropriately bore a greater share of the production costs. This led to more accurate reporting of the cost of parts and a strategic advantage for the then emerging division of John Deere. (Turney, 1992) This early attempt at ABC, with its operational weaknesses, led to the development of the current model and the components described in the opening of this section.

As shown in Figure 3.2, traditional systems utilize a two-stage approach to assign an organization's indirect and support expenses to the cost of a product or service. The first step involves collecting these support expenses in cost pools and then assigning them to production units or services based on volume drivers. It is through the disjointed relationship between indirect costs and the volume drivers that traditional systems introduce distorted costs. (Cooper et al., 1992a)

Activity-based systems, in contrast to traditional systems, assign costs to an organization's resources that are used in activities. These costs are in turn linked to the products or services of the organization. The result is a more accurate measure of the true, and not volume-related, costs associated with a particular product or service. (Cooper et al., 1992a)

THE TRADITIONAL TWO STAGE APPROACH



THE ACTIVITY-BASED TWO STAGE PROCEDURE

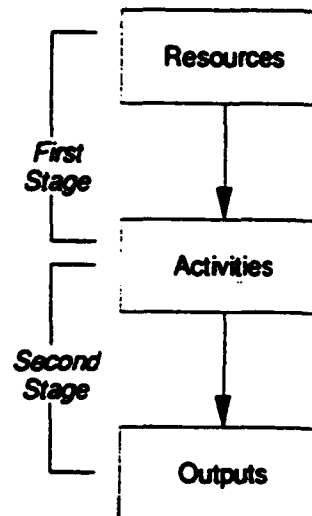


Figure 3.2: Traditional vs ABC Cost Assignment
Source: Cooper et al., 1992a

The value of this more accurate product or service cost has immediate decision-making implications to the manager. It should be stressed at this point that ABC systems do not make decisions – managers armed with better information still make decisions – good or bad. Decisions regarding pricing products or services, introducing or discontinuing products or services, and determining what level of production to maintain are all examples of decisions supported by a well-structured ABC system. (Cooper et al., 1992a)

In addition to providing product cost information, ABC systems allow a more extensive examination of the activities involved in the production of an organization's outputs. With

information on the activities, managers are better able to determine inefficient procedures or ones that add no value to the output. Focusing on activities and the cost of those activities in relation to the output can lead to process improvement and greater efficiencies. (Cooper et al., 1992a) It is logical, then, that activity-based management (ABM) be a natural outgrowth of an ABC system. Figure 3.3 shows this relationship to an ABC model.

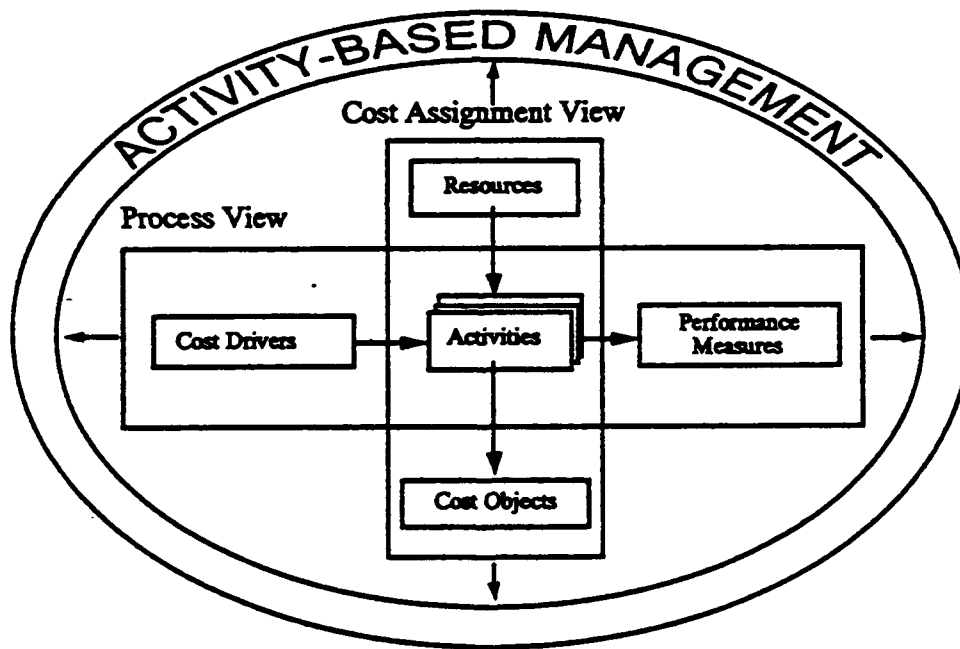


Figure 3.3: ABM and Its Relationship to ABC
Source: Turney, 1992

Activity based management is defined as:

- A discipline focusing on the management of activities as the route to continuously improve both the value received by customers and the profit earned by providing this value
- Includes cost-driver analysis, activity analysis, and performance analysis
- Draws on activity-based costing as a major source for data and information (Cokins et al., 1993)

2. Design of an Activity-based Costing System

As stated previously, ABC does not involve difficult concepts. Recent case studies have shown that the design and implementation of ABC systems also follows a "generally accepted" set of practices. (Cooper et al., 1992a) The studies also indicated that the degree of commitment from an organization in terms of financial, personnel, and time resources is relatively modest. (Cooper et al., 1992a)

The design of an ABC system generally follows four interrelated steps: (1) identify the activities performed to produce outputs; (2) relate the usage of resources to these activities; (3) identify the outputs produced; and (4) utilizing activity cost drivers, link the activity costs to the outputs. (Cooper et al., 1992a) Each of the four steps will be discussed.

a. Identify activities

Determining the activities that generate outputs is generally not that difficult for an organization. However,

determining the appropriate level of detail relating to activities is perhaps the most difficult aspect of designing an ABC system. (Cokins et al.,1993) As the number of activities selected increases, so will the cost of measurement. (Cooper et al.,1992a)

There are two factors that determine the cost of measurement with respect to the number of activities selected. First, the amount of resources consumed by each activity must be identified; in addition, the number of times that the activity must be performed for each output needs to be determined. As the number of activities and outputs increase, the results increase exponentially with the amount of data required. Secondly, costs increase as greater detail of the activities is attempted. Greater effort must be expended, and therefore greater cost, to breakdown individual activities into increasingly smaller and smaller subroutines. (Cooper et al., 1992a)

From Cooper's study, the number of typical activities identified in an organization's first ABC study was between 25 and 100. (Cooper et al.,1992a) Table 3.1 provides examples of activities from a manufacturing environment.

b. Assign resource costs to activities

Once activities have been identified, the resources utilized by those activities must be determined. There are generally three methods in determining how to assign

TABLE 3.1: TYPICAL ACTIVITIES IN MANUFACTURING

Procurement

- Purchase order processing
- Contract negotiations
- Processing accounts payable

Production

- Shop floor control
- Facility maintenance

Production management

- Sales forecast
- Monitor production
- Inventory material

Quality Control

- Customer complaints
- Shop floor process control
- Quality complaint analysis
- Final inspection

Source: Cooper et al., 1992a

organizational resources to activities. They are, listed in descending order of preference, direct charging, estimation, and arbitrary allocation. Direct charging most accurately captures the costs associated with the resources being used. This is typically accomplished by measuring the actual usage through meters or observation. (Cooper et al., 1992a)

The next method of assigning costs is by estimating. This is typically done by conducting interviews or

by survey data. Not as reliable as direct charging, estimation can still provide fairly reliable data.

The final method of determining cost assignments is by arbitrary allocation. The danger inherent in this method is the term arbitrary. This method involves introducing distortions in cost that are found in traditional methods of cost allocation. It should be used only as a last resort. (Cooper et al., 1992a)

c. Identify outputs

Outputs are the reason that activities take place. However, there are non-value added activities. These are activities that take place that do not produce output. Outputs are what the organization produces, whether it is in the form of products or services. It is important that in the design of an ABC system all outputs be identified. If all outputs are not properly identified, then the cost of resources for the unidentified outputs are mistakenly assigned to those outputs that were recognized. This identification process must also take into account when the outputs were produced. Future and past products must be differentiated from present outputs. (Cooper et al., 1992a)

d. Link activity costs to outputs

The final step, linking activity costs to the outputs, is performed in the same manner in which the costs of the resources were assigned to activities. As previously

mentioned, the three potential methods are direct charging, estimation, and arbitrary allocation.

Depending on the number of outputs of an organization, direct charging may not be practical. Typically, in a manufacturing organization, labor and material are examples of activity costs that can be directly charged to particular outputs. If direct charging cannot be achieved, then the alternatives of estimation and arbitrary allocation must be used. Again, arbitrary allocation should be the last resort due to the inherent distortions that can be introduced into the system. Estimation is less costly to perform than direct charging and generally more accurate than arbitrary allocation. It is commonly the method chosen by system designers. Table 3.2 presents activity cost drivers commonly found in a manufacturing setting and commonly used with the estimation method. (Cooper et al., 1992a)

Activity cost drivers may also be classified by the pattern in which resources are consumed. For example, *transaction* drivers are used when each unit of output makes the same resource demands on the activity. Transaction drivers count the number of times the activity is performed for each output. (Cooper et al., 1992a) Processing a check or moving material for a product are examples of a transaction drivers.

Another common type of activity cost driver is the *duration* driver. Duration drivers measure the length of time an activity is performed on an output. Activities such as

TABLE 3.2: ACTIVITY COST DRIVERS

TYPICAL ACTIVITY COST DRIVERS in MANUFACTURING

●Internal ECNs	Number of alterations notices per product
●Units Produced	Production quantity of finished products
●P.O. Line Items	Number of receipts for each raw material and purchased part
●Stockroom	Number of stock-to-stock transfers per part number
●Direct Labor Hours	Hours of direct (standard) labor per product
●Toolroom Hours	Hours of toolroom labor per part number
●Sales per Device	Dollar sales by device
●Scrap Dollars	Dollars of reported scrap per product
●Number of Complaints	Customer complaints per product

Source: Cooper et al.,1992a

setups of machinery for particular products and direct labor are typically measured by duration. (Cooper et al.,1992a)

The choice of which type of driver, transaction or duration, typically becomes one of economics. Duration drivers are generally more accurate, but they are also more costly to measure. The benefits of accuracy must be weighed against the added cost. (Cooper et al.,1992a)

3. Level of activity classification

One of the many strengths of an ABC system is its ability to provide information to the user at an appropriate level. In order to provide the information, activity-based systems classify activities along various dimensions. Three popular classifications are: (1) activity centers, (2) activity hierarchies, and (3) value added. (Cooper et al., 1992a)

a. Activity centers

Activity centers are typically a grouping of related activities. These activities may be grouped by function or by process. (Turney, 1992) Examples of activity centers include packaging, finishing, and order processing.

b. Activity hierarchies

Activity hierarchies are derived by recognizing that activities occur at different levels of cost variability. Examples from a hierarchical model in a manufacturing setting include:

- Unit volume: performed every time a unit is produced
- Batch-related: performed every time a batch is produced
- Product-sustaining: performed to enable a product to be produced
- Technology-sustaining: performed to enable a technology to produce a product
- Customer-sustaining: performed to service customers and prospects

- **Facility-sustaining:** performed to enable production to occur (Cokins et al., 1993)

c. Value rankings

Value rankings of activities involves setting a value to every activity performed in an organization. The value is derived from a system of measurement determined by the organization. For example, the metric may be how much value is added to a product from a customer's standpoint or the activity's relationship (required or not required) in the production of a product. (Cooper et al., 1992a) An example of what is becoming a nonvalue-added process in total quality manufacturing settings is intermediate quality inspections. Quality inspections no longer add value to a product when employees do not allow defects to pass from their assigned process.

4. Implementation of ABC

After the analysis and design of an ABC system, the logical progression is implementation and sustainment. While much has been written regarding the concepts and the pros and cons of ABC, studies regarding implementation are just coming into print. One such study was conducted in 1991 by the Cost Management Group, a Member Interest Group of the Institute of Management Accountants (IMA). The results of this study indicated that the use of a task force approach was the dominant method in the implementation of ABC. The team

approach has the benefit of spreading project ownership and therefore increased probability of success. (Schiff, 1992)

Another study, sponsored by the Committee on Research of the IMA, examined implementation of ABC in eight companies. Five of the eight sites were manufacturing organizations, one was a financial services company, another was a finance department of a large energy company, and the last was a distribution company. One of the significant findings in this study was that it is critical to have a plan to make the transition from the analysis stage to the action phase. The intent of implementing an ABC system in these companies was providing line managers better information in order for them to take action and make more informed decisions. Without a plan to move from analysis to action, a continuous cycle through analysis and refinement tends to develop; however, no management decisions or actions are ever taken by line managers. Cooper coined this pattern as the "Field-of-Dreams" strategy. "If I build it [the ABC model], the line managers will come [and take action]." (Cooper et al., 1992b, p.57)

As an additional result of this study, 12 basic steps were identified in the implementation of an ABC system. They are listed here and expanded upon in the Appendix.

1. Determine the project's scope, timing, and objectives.
2. Fact find.
3. Develop a project team and work plan.

4. Carry out training.
5. Capture activity-related information.
6. Do value-added coding of activities.
7. Create activity centers.
8. Code payroll-related expenses into hierarchy categories.
9. Split and code nonpayroll-related expenses.
10. Identify and capture cost driver information.
11. Load the model.
12. Run the model and generate reports.

(Cooper et al., 1992a)

The final step in the process is to analyze the results of the model. If the system was properly designed and the appropriate data collected, the reports generated should address the objectives and business issues established or identified at the beginning of the undertaking. However, further analysis and interpretation of the results may be required before making recommendations on the direction in which to proceed. (Cooper et al., 1992a)

E. SUMMARY

Traditional accounting systems originated to allow the internal user of financial data to make informed decisions. However, as organizations became larger, product lines became more diverse, and the focus shifted toward external users of financial data. As a result, traditional systems have become

less and less useful to internal users. The line manager now is faced with distortions in product cost caused by traditional volume-based accounting systems.

Traditional systems utilize a two-stage approach to assign an organization's indirect and support expenses to the cost of a product or service. The first step involves collecting these support expenses in cost pools and then assigning them to production units or services based on volume drivers. It is through the disjointed relationship between indirect costs and the volume drivers that traditional systems introduce distorted costs.

Activity-based systems, in contrast to some traditional systems, assign costs of an organization's resources to activities. The costs of these activities are in turn linked to the products or services of the organization. The result is a more accurate measure of the costs associated with a particular product or service.

The next chapter examines the application of activity-based costing at Monterey-Salinas Transit. Monterey-Salinas Transit currently utilizes traditional accounting methods in its operation. In addition, Monterey-Salinas Transit offers a unique opportunity for the introduction of an ABC system in that little research has been completed in the implementation of ABC in service organizations.

IV. IMPLEMENTING ACTIVITY-BASED COSTING AT MST

The purpose of this chapter is to examine the applicability and implementation of an activity-based costing system in a service organization, Monterey-Salinas Transit. The intent of the analysis is to provide the management of Monterey-Salinas Transit with costing information that is more accurate when compared to the information that currently may be obscured or distorted by their traditional accounting system.

The process of developing an activity-based costing system for Monterey-Salinas Transit follows the logic of the steps outlined in Chapter III. The steps are further expanded upon in the Appendix.

A. DETERMINING THE PRODUCT

In order to begin the development of an activity-based system for Monterey-Salinas Transit, the product of Monterey-Salinas Transit had to be determined. When compared to a manufacturing setting, the determination of the product is difficult in service industries. Often the product of service industries is a "package of service benefits," many of which are intangible. Examples include speed of service, convenience, and customer satisfaction. (Rotch, 1990) These intangibles also make direct measurement in service

enterprises more complicated. Also, the definition of the product is dependent on the view of who is proffering the definition. The customer, management, and the designer of the accounting system may differ in opinion as to what the product is and how to evaluate it. Monterey-Salinas Transit is faced with the same dilemma. The choice of the product(s) is critical because this decision and the concomitant measurement determines the complexity and depth of data required for the ABC system. Various dimensions of product and measurement for Monterey-Salinas Transit are:

- Distinct bus routes
- Hours of service
- Number of passengers served
- Miles of service
- Farebox recovery
- Less traffic congestion
- An individual bus
- A combination of the above

The selection of the product ultimately came down to two choices: vehicle service hour (VSH) and individual bus routes. Other choices were ruled out for various reasons, such as difficulty of measurement or wide variances over the spectrum of measurement. Less traffic congestion provides an example of a product being difficult to measure in terms that are meaningful to the cost analysis of the transit system. Another

option ruled out was the number of passengers served. This number varies widely from route to route, by time of day, from day to day, and by season. A related issue is unused capacity which will be covered in a later section. A discussion of vehicle service hours and bus lines or routes follows.

1. Vehicle Service Hour

Vehicle service hours are defined as the number of hours that a vehicle is available to pickup or discharge passengers. A vehicle service hour, as a choice for a product of Monterey-Salinas Transit, offers several attractive attributes. One attribute is precision; costs traced to a vehicle service hour can provide Monterey-Salinas Transit management with very precise operating cost data. Another attribute of the vehicle service hour is that it allows a simplified break-even analysis between revenues and costs. Finally, an additional attribute in favor of selecting the vehicle service hour is that it is already recognized as an industry norm, thus providing a familiar concept which will facilitate springboarding from traditional costing into ABC.

The vehicle service hour also has negative attributes. The most critical is a lack of measurable diversity. Vehicle service hours currently do not capture the diversity that exists due to factors such as geography (hills versus flat terrain) or demographics of a specific route. As discussed in

Chapter III, activity-based systems provide meaningful cost differences when product diversity exists.

2. Bus Route

As a product of Monterey-Salinas Transit, an individual bus route has a collection of stops made by a particular bus along a set itinerary. The bus route, like the vehicle service hour, has positive and negative attributes.

From a positive standpoint, the bus routes have the attribute of diversity among a combination of dimensions such as miles served and the number of passengers. This diversity is easily definable and it lends itself to activity-based costing. In addition, the current cost accounting system at Monterey-Salinas Transit captures some of the costs associated with a particular bus route.

A negative attribute is that the bus route as a product may lack the accounting precision desired by management. Since bus routes can vary by length, time, and ridership, they introduce estimations and allocations of costs that cannot be directly attributable to an individual route.

3. Product Choice

Several attributes led to the choice of an individual bus route over the vehicle service hour for use at Monterey-Salinas Transit. The two most decisive attributes were the diversity and familiarity offered by the bus route.

Where the vehicle service hour offers precision, it lacks measurable diversity. If no diversity exists among products, then the traditional method of spreading costs across all products may be suitable. Considering the bus route as a product however, does provide a view that all routes do not cost the same to operate.

Additionally, the choice of the bus route requires no new concepts, only a different way of viewing the costs associated with a bus route. In contrast with the vehicle service hour, the current cost management system at Monterey-Salinas Transit collects data for bus routes that measure the differences among the various routes. Also, the collection of the data imposes no new costs to the system and current data is sufficiently precise to be usable.

B. HIERARCHY OF ACTIVITIES

The next step in designing an ABC system involves identifying the activities performed within the organization. Once the activities are identified, they are arranged in a cost hierarchy.

Typically, the lowest level in a activity-based systems is the unit level. At Monterey-Salinas Transit the unit level would capture the activities directly traceable to the individual bus route. Unit level activities include:

- Clean vehicle

- Service vehicle
- Driver training
- Safety inspection of vehicle

Above the unit level is the batch level. Batch level activities occur as a result of producing more than one product, or in this case a number of bus lines. Examples of batch level activities at Monterey-Salinas Transit include:

- Route design, scheduling and coordination
- Dispatcher control of bus lines
- Supervise mechanics

Above the batch level are product and facility sustaining activities. Examples of product sustaining activities include marketing, advertising, and customer service. Guard services is an example of facility sustaining activity. Figure 4.1 shows the relationship of the activity costs.

C. ESTABLISH ACTIVITY CENTERS

Several methods are available to group activities into activity centers. For example, they may be grouped by function, business process, business issue, or organizational structure. Following the logic of the guidelines found in the Appendix, the choice is generally software (if used) dependent. Additional factors influencing the choice of method include the level of detail desired by management. For

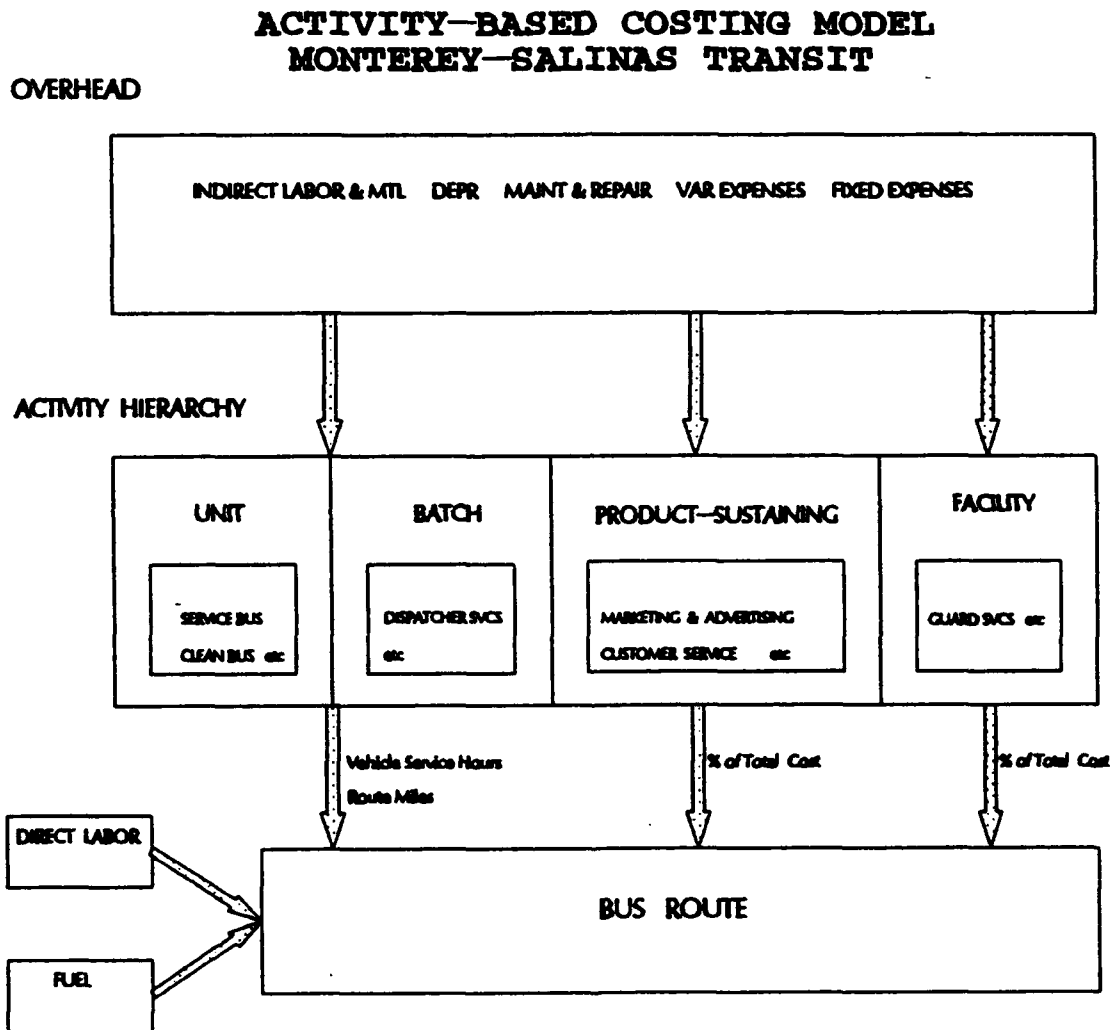


Figure 4.1: MST Activity-Based Costing Model

example, the maintenance department might be chosen as an activity center, or it may be further broken down into smaller activities such as repair, servicing, and inspection.

Grouping activities by business processes instead of by organizational structure provides additional insight for Monterey-Salinas Transit. In grouping by a process, maintenance for example, Monterey-Salinas Transit would be able to determine the total costs associated with conducting maintenance regardless of the entity or department conducting the maintenance. This choice requires greater detail in data collection and, therefore, a greater number of defined activities. This, too is a decision that must be addressed by management.

D. CAPTURE COST DRIVERS

The next step in developing an activity-based system for Monterey-Salinas Transit is linking the costs of the activities to the products that caused the use of resources. This linkage is known as a cost driver. Capturing the cost drivers presents the greatest challenge of design and implementation of activity-based costing at Monterey-Salinas Transit. There are three dimensions that add to the complexity of the relationship between cost drivers and activities at Monterey-Salinas Transit. These characteristics are similar to those found by researchers investigating

activity-based costing at Amtrak (Rotch, 1990): the extensive amount of indirect costs, defining which costs are variable, and handling costs that follow a stair-step function.

1. Quantity of indirect costs

Costs associated with the bus drivers, such as salaries and fringe benefits, are easily traced to the output. Fuel usage is also fairly straight forward; standard consumption estimates can provide reliable estimates. Beyond these direct costs, however, the ability to accurately trace indirect costs to the product becomes extremely difficult. For example, since Monterey-Salinas Transit does not assign one particular revenue vehicle to a particular route, the maintenance costs associated with the vehicle can not be directly traced to the route. At best, the costs can be traced utilizing route miles for a particular route. However, this assumes that all routes and their vehicle service hours make the same demands on each vehicle used regardless of age of the vehicle or geography of the route.

2. Degree of cost variability

In the study of activity-based costing at Amtrak, cost variability also became an issue in tracing costs to an activity. The degree of cost variability is dependent on the perspective taken by management. If, for example, a strategic longer-range outlook is desired by management, all costs become variable. At Amtrak, variable costs became known as

"short-term avoidable." This view was used in the context of adding or dropping specific routes. (Rotch, 1990) This is also an issue at Monterey-Salinas Transit.

3. Stair-step costs

Monterey-Salinas Transit, as in manufacturing industries, faces costs that follow a stair-step function. What makes the step-function at Monterey-Salinas Transit unique is the range over which these costs can occur. As in manufacturing, unused capacity is difficult to measure. Add one more product, in this case another bus route, and no indirect costs may change. Add two more and all of the indirect costs may change. Typically, changes in volume are associated with unused capacity issues, and that is the case for Monterey-Salinas Transit. For example, a particular bus that has a capacity to seat 50 passengers may not be full throughout the entire route. This unused capacity may vary by time of day or by where the vehicle is along the route. Time, demographics, and vehicle capacity are all factors affecting unused capacity at Monterey-Salinas Transit. Constituency or political demands may require a particular route or a specific time a route be serviced. From Monterey-Salinas Transit's standpoint, this results in vehicles with unused capacity across the spectrum of time or route miles.

E. ESTIMATE OR ALLOCATE

The discussion that preceded raises the issue of how to accurately drive the cost to the product or bus route. The problem is whether to try to capture the exact costs or to use a less accurate method of attaching indirect costs to the product. As discussed in Chapter III, estimation or allocation are two options with estimation the generally preferred method, though both methods are prone to introducing distortions in the activity-based system. However, by breaking down costs into smaller components and giving them greater visibility, management may be able to provide a more accurate cost driver estimate and therefore minimize the distortion introduced. While estimating may be more accurate, an advantage of allocation is the ease with which it is performed. With allocation, there are no complex linkages involved and no complicated formulas. Every unit of output is apportioned a share of the indirect costs. However, allocation introduces the greatest possibility of distortion in the costing system. This is precisely the shortcoming activity-based costing is attempting to overcome.

F. COMPARING PRODUCT COSTS AT MST

This section presents an activity-based cost system for Monterey-Salinas Transit based on the previous discussion. The product cost of this activity-based system is then compared to

the output of the traditional cost system at Monterey-Salinas Transit.

Data for the analysis includes annual information regarding total vehicle service hours, total route miles, and total passengers. This data is provided for Monterey-Salinas Transit as a whole and is also provided for a selected bus route. Table 4.1 contains the information.

TABLE 4.1: MST/ROUTE 1 DATA

	PASSENGERS	ROUTE MILES	VSH
MST	3,596,376	2,369,936	153,011
ROUTE 1	274,196	99,450	10,127
Source: LGFA, 1992			

Pertinent cost data, extracted from Monterey-Salinas Transit's annual income statement for fiscal 1992, is summarized in Table 4.2. The data has been aggregated to correlate to costs/activities in the activity-based analysis that follows. This aggregation does not change or obscure the annual expenses of Monterey-Salinas Transit.

1. Assumptions In The Analysis

Several assumptions were required in order to provide a meaningful analysis of both the traditional cost system and the activity-based system. First, it was assumed that vehicle

TABLE 4.2: MST ANNUAL EXPENSES

OBJECT CLASSIFICATION	AMOUNT
OPERATORS - SALARIES/FRINGE	3,750,844
SUPERVISORS - SALARIES/FRINGE	356,675
FUEL/OIL	377,674
BUS MAINTENANCE (TIRES/TUBES/OTHER MATLS)	576,065
CASUALTY/LIABILITY INSURANCE	202,590
DEPRECIATION	1,205,855
ADMINISTRATIVE - SALARIES/FRINGE	2,021,160
MISCELLANEOUS (SERVICES/LEASES/TAXES etc.)	793,737
UTILITIES	100,777
TOTAL EXPENSES	9,385,377

Source: LGFA, 1992

service hours and route miles were homogeneous throughout the year and across the spectrum of routes. It is recognized that, intuitively, a route with more hills would consume more fuel than a relatively flat route of equal distance. No system currently exists at Monterey-Salinas Transit to capture data at that level of precision.

The number of stops along a route were not considered. Intuitively, a route with more stops should bear more costs due to the increased costs for stops and the equipment at the stops. There are, for example, different costs associated with the type of equipment at each stop. A stop with a sign alone costs less than a stop with a sign and bench. It also follows that a stop with a shelter costs more than one without a

shelter. This may be an issue for management to consider in refining the data collection in an iterative process to determine more precise route costs.

Depreciation was included in both the traditional and activity-based costing analysis. Typically, management at Monterey-Salinas Transit does not include it as a determinant in their standard vehicle service hour or cost per route mile computations. It was included for the analysis in order to present a more accurate determination of costs. The result of removing depreciation would have lowered the total costs of both the traditional and ABC analysis by approximately 12 percent. Depreciation was spread evenly across the 27 products or routes of Monterey-Salinas Transit. This method was selected since Monterey-Salinas Transit does not assign a particular vehicle to a particular route. It would be unreasonable to determine the exact depreciation associated with a particular route based on the age of the vehicle serving that route on a daily basis.

2. Activity-Based Cost For Route 1

As discussed earlier, the product of Monterey-Salinas Transit was determined to be a bus route. This allows the capture of the mileage and time diversity among routes. This in turn, takes advantage of activity-based costing's ability to high-light cost relationships. Figure 4.1 illustrates the flow of costs from activity centers in the activity hierarchy

to the product. Table 4.3 gives the activities and costs that were selected for the analysis and their linkage to the product.

TABLE 4.3: ABC LINKAGES FOR MST

COSTS and ACTIVITIES	LINKAGE	QUANTITY
Operators sal/fringe	VSH	10,127 hrs.
Supervis. sal/fringe	VSH	10,127 hrs.
Fuel/Oil	Route Miles	99,450 mi.
Bus maintenance	Route Miles	99,450 mi.
Casualty/Liability Insurance	Route Miles	99,450 mi.
Depreciation	by # of routes	3.7%
Administrative expenses	by # of routes	3.7%
Utilities	by # of routes	3.7%

Utilizing the data from Tables 4.1 and 4.2 and applying the linkages from Table 4.3, costs for Route 1 can be determined. These costs are the activity-based derived costs for the route for a year. They appear in Table 4.4.

3. Traditional Cost For Route 1

The current methods of determining route cost at Monterey-Salinas Transit are through the use of vehicle service hours or route miles. In the case of cost for a vehicle service mile, the annual total cost (less depreciation as discussed previously) is divided by the total number of

vehicle service hours. The calculation for the cost of a route mile is computed in the same manner using total costs and total route miles for the year.

TABLE 4.4: ANNUAL ACTIVITY-BASED COSTS FOR ROUTE 1

OBJECT CLASSIFICATION	AMOUNT
OPERATORS - SALARIES/FRINGE	\$248,248
SUPERVISORS - SALARIES/FRINGE	23,606
FUEL/OIL	15,848
BUS MAINTENANCE (TIRES/TUBES/OTHER MATLS)	24,174
CASUALTY/LIABILITY INSURANCE	8,501
DEPRECIATION	44,661
ADMINISTRATIVE - SALARIES/FRINGE	74,858
MISCELLANEOUS (SERVICES/LEASES/TAXES etc.)	29,398
UTILITIES	3,732
TOTAL EXPENSES	\$473,026

These measures of cost alone do not produce costs for a particular route. In order to produce a route cost these measures are multiplied by the appropriate attribute (vehicle service hours or route miles) for the particular route. The attributes for Route 1 are listed in Table 4.1. The cost of Route 1, as measured by each attribute, is listed in Table 4.5.

4. Cost Comparison and Conclusion

Comparing the three costs derived from the two cost systems, the activity-based cost falls between the high and low values determined utilizing the methods of the traditional system. The three cost values appear in Table 4.6.

TABLE 4.5: ANNUAL TRADITIONAL COST FOR ROUTE 1

Cost per VSH:	\$ 61.34
Cost per Route Mile:	\$ 3.96
Route 1 cost as a function of VSH:	\$ 621,190
Route 1 cost as a function of Route miles:	\$ 393,822

TABLE 4.6: ROUTE 1 COST COMPARISON

VSH COST (TRADITIONAL):	\$ 621,190
ACTIVITY-BASED COST:	\$ 473,026
ROUTE MILES COST (TRADITIONAL):	\$ 393,822

An analysis of the three methods explains the differences in costs and leads to a conclusion as to which one is the most accurate. The manner in which overhead and direct costs are identified with output in the traditional system lacks precision found in the activity-based cost system. In the traditional system, all the costs are aggregated and spread across all routes based on a particular measure. Depending on the measure used, route miles or vehicle service

hours, distortion is introduced in the system. For example, if route miles is the chosen measure, routes with higher mileage will bear more cost than shorter routes, regardless of the amount of vehicle service hours required to produce the route. There is no attempt to link the cost to the activity that caused it. There is also no attempt to link the activity and its associated cost to the product. This is precisely the weakness of traditional accounting systems.

In contrast, the cost generated by the activity-based system links activities and their associated costs to the product that caused the activities. In this case, the costs directly attributable to Route 1 (operator and supervisor salaries, fuel and oil, maintenance, and insurance) are linked specifically to Route 1. This amounts to 56 percent of the activity costs generated linked directly to the product. With continued refinement of the defined activities at Monterey-Salinas Transit and improved methods of linking the remaining costs (depreciation, administrative, miscellaneous, and utilities) to the routes, it is not unreasonable to assume that a greater percentage of costs could be directly attributed the product. This would result in a more precise cost for each of the products or routes of Monterey-Salinas Transit.

It should be noted that implementing activity-based costing techniques will not directly change the costs of Monterey-Salinas Transit. Activity-based costing simply gives

greater definition to what generated the costs and the connection to the individual product.

V. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

The purpose of this thesis was to examine the applicability of an activity-based costing system in a medium-sized transit system. As discussed service industries such as Monterey-Salinas Transit offer unique opportunities to evaluate activity-based costing implementation, and implementing an activity-based costing system at Monterey-Salinas Transit raises certain specific issues.

As shown by the model in Chapter IV, activity-based costing does produce route costs that differ from those derived using the traditional system in place at Monterey-Salinas Transit. The precision of the costs produced by an activity-based system certainly can be improved with further definition of activities and developing linkages to the product. This may take several iterations in the analysis of operations at Monterey-Salinas Transit. Whether management desires to expend the manhours and cost for additional study cannot be answered by this thesis. Nor can the answer be given regarding whether or not management feels that the differences between activity-base system derived costs and traditional system costs are significant enough to move forward with activity-based costing.

Whether or not activity-based costing can even be effectively applied at Monterey-Salinas Transit remains an issue. As reported by Rotch (1990) in his studies of service industries, some organizations may not be suited for implementation of activity-based costing systems; Monterey-Salinas Transit may be such an example. Lack of output diversity and the difficulty in linking activity costs directly to the product pose obstacles for implementation of an accurate activity-based costing system. In addition, it may prove to be too costly to accurately link costs to the product.

B. RECOMMENDATIONS

To dismiss activity-based costing concepts without further study would deprive Monterey-Salinas Transit of some of the ancillary benefits of activity-based costing. As an analytical tool, activity-based costing, when compared to some traditional accounting systems, provides a different view of the product and the costs that give rise to the product. Even without quantifiable cost data, management can take advantage of the insights gained by an activity and cost driver analysis of the organization. Answering the issues raised during analysis may highlight support activities that are inefficient or add no value to the product.

Further study of activity-based costing may well be warranted at Monterey-Salinas Transit. However, management

must acknowledge that the cost of additional study, and implementation of activity-based costing may prove to be costly in the near-term. The long-term benefits of activity-based costing, however, may well be worth the investment.

APPENDIX: FUNDAMENTAL IMPLEMENTATION STEPS of ABC

The following information is reprinted from *Implementing Activity-Based Cost Management: Moving From Analysis to Action*, by Robin Cooper et al, 1992.

This appendix is intended to provide an approach that has been used successfully to implement activity-based costing in a variety of industries. The approach assumes that a computer software package is being utilized as a part of the implementation. If it is not, the approach and terminology may vary to a certain degree but will remain largely the same. This appendix assumes the reader has an understanding of ABC and the related ABC terminology. The approach includes 12 basic steps, which are covered below:

1. *Determine the scope, timing, and objectives of the project.* What buildings, employees, product lines, and so forth are to be included in the study? What period of time is the study going to cover and what are the start and completion dates? What are the key business issues? What kind of information does the company want generated by the project?
 - A static product costing model of all end products/services;
 - Value analysis;
 - Cost of quality information;
 - A dynamic model with "what if" capabilities for business expansion/contraction;

- Cost information on serving certain customers or distribution channels.
2. *Fact find.* Before launching an ABC project, it is important to understand how the business is functioning currently in order to form the basis for a solid project plan and successful implementation. Knowledge about the current material and information flow can be acquired from available flow charts, organization charts, P&L statements, interviews, and current cost system and other information systems-related documentation.
 3. *Develop a project team and work plan.* A cross-functional team should be placed in charge and be held responsible for completing the project. Team members should include representatives of at least the financial, operations, and information systems areas. A detailed project work plan should be created, covering the tasks, timing for completing the tasks, and person(s) responsible for completing them.
 4. *Carry out training.* Training will be required at various intervals throughout the project:
 - Executive and related staff training is required before the project is launched to gain and maintain top-down support;
 - Project kickoff training is required for department heads at the start of the project;
 - Implementation training for the project team usually is done during each new phase of the project;
 - Applications training is performed during and after implementation to get employees making operational changes to the business as information is made available.
 5. *Capture activity-related information.* Determine the activities performed by all the employees included in the study. Use an activity dictionary (an extensive listing of precoded and defined activities by industry) wherever possible to avoid extensive interviewing. Capture employee time by activity for the time period included in the study. This can be done by a number of different methods but normally is done by estimating time.
 6. *Do value-added coding of activities.* Some companies want to make process improvements and/or reduce costs without

sacrificing customer service. An ideal way to understand where opportunities exist is coding activities using a value-added coding scheme. There are a variety of such schemes; companies should pick one that meets the objectives of the business.

7. *Create activity centers.* Depending on the ABC software, it may be possible to segment activities within or across departments into activity centers. Activity centers provide another means of capturing information for the objectives and business issues identified at the beginning of the project. Activity centers allow activities to be captured along business processes rather than functional departments if so desired to provide additional insight to the business. Activities usually are driven to activity centers using a first-stage driver such as percentage allocation or number of occurrences.
8. *Code payroll-related expenses into hierarchy expenses.* Payroll activities should be coded to hierarchy categories (unit, batch, product-sustaining, facility sustaining, and administrative if desired). This segregation will enable the company to understand better the impact of making certain changes to the business. For example, what the impact will be of increasing volume 20%; what expenses could and should go away if a product line is phased out.
9. *Split and code nonpayroll-related expenses.* Like payroll-related expenses, nonpayroll expenses (activities) need to be split into logical activity centers and coded to hierarchy categories (unit, batch, product-sustaining, facility-sustaining, and administrative if used). For example, unit-related expenses most likely will be related to the production activity center and coded as unit-sustaining expenses. The same process should be used to scrutinize batch, process, facility-sustaining, and administrative expenses.
10. *Identify and capture cost driver information.* Each individual activity needs to have a link to an end product/service(s). This link normally is made through a second-stage cost-driver that is measurable and identifiable to a component or end product/service. Interviews normally are conducted with informed persons to review the activities performed so as to determine the ideal and surrogate second-stage cost drivers. Companies that have captured second-stage driver quantities at the component level will need to create or

download a bill of materials into the ABC model to get the associated cost to the end products in the model.

11. *Load the model.* Expenses from the general ledger should be loaded into the model at the line item level. The steps carried out above will allow the expenses to be split into activities and driven to activity centers using first-stage drivers. When indicated, second-stage drivers then will take activities to the products. Product identification numbers will need to be loaded into the model to happen. Inputting hierarchy codes and value-added codes by activity should be performed as part of loading the model.
12. *Run the model and generate reports.* Model output reports can be generated once input data are in the model and validation routines have been performed to ensure data integrity. A variety of output reports can be generated depending on the information needed of the user, some of which have been included in the eight ABC case studies included in this research project. Data also can be downloaded to a Lotus 1-2-3/graphics file for further analysis by the user.

As a final step, *analyze the results.* If the ABC project has been structured properly, most of the objectives and business issues identified or established at the beginning of the project should now be addressed, based on the data collected and reports generated. Additional analysis may be required to interpret the results and provide the basis for recommendations going forward.

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